WHAT IS CLAIMED IS:

1. A plasma processing apparatus comprising:

a processing chamber;

a microwave oscillator for generating microwaves;

an antenna for radiating the microwaves to said processing chamber;

a waveguide for introducing the microwaves, which are generated by said microwave oscillator, into said antenna;

a load matching device that is disposed on said waveguide and that adjusts an impedance;

a wave detector that is disposed on said waveguide and that detects the microwaves reflected from said processing chamber; and

a controller for controlling said load matching device to match an impedance of said processing chamber, which is calculated based on the detected microwaves measurement, with an impedance of said microwave oscillator.

2. A plasma processing apparatus according to Claim 1, wherein:

said controller comprises a load matching device adjustment calculation unit for calculating an amount of adjustment to which said load matching device should be adjusted in order to match the impedance of said processing chamber with the impedance of said microwave oscillator; and an adjustment signal output unit for transmitting as an adjustment signal a calculated amount of adjustment multiplied by a predetermined value smaller than 1; and

said load matching device is repeatedly controlled until the impedance of said processing chamber matches the impedance of said microwave oscillator.

3. A plasma processing apparatus according to Claim 2, wherein:

said controller further comprises a plasma

detection unit that detects generation of plasma in said processing chamber;

if said plasma detection unit determines that no plasma is being generated, said adjustment signal output unit transmits an amount of adjustment, which said load matching device adjustment calculation unit has calculated, as an adjustment signal as it is;

if said plasma detection unit determines that plasma is being generated, said adjustment signal output unit transmits as an adjustment signal the amount of adjustment, which said load matching device adjustment calculation unit has calculated, multiplied by a predetermined value smaller than 1.

4. A plasma processing apparatus according to Claim 2, wherein:

said controller further comprises an adjustment detection unit that detects a adjustment position by which said load matching device is adjusted;

said controller controls said load matching device according to a difference between the adjustment signal transmitted from said adjustment signal output unit and the signal of the adjustment position.

5. A plasma processing apparatus according to Claim 1, wherein said load matching device has stubs.

6. A plasma processing apparatus according to Claim 1, wherein said load matching device has short plungers.

7. A control method for plasma processing apparatus that utilizes plasma generated by radiating microwaves to a processing chamber, comprising the steps of:

calculating an impedance of processing chamber on the basis of the microwaves reflected from said processing chamber;

calculating an amount of adjustment, which is required in order to adjust the impedance of said processing chamber to match the calculated impedance of

said processing chamber with an impedance of the microwave oscillator;

transmitting as an adjustment signal the calculated amount of adjustment multiplied by a predetermined value smaller than 1; and

repeatedly controlling the impedance of said processing chamber according to the transmitted adjustment signal until the impedance of said processing chamber matches the impedance of said microwave oscillator.

8. A control method for plasma processing apparatus according to Claim 7, wherein:

if no plasma is generated at said step of transmitting a signal, the calculated amount of adjustment is transmitted as an adjustment signal as it is; and

if plasma is generated, the calculated amount of adjustment multiplied by a predetermined value smaller than 1 is transmitted as the adjustment signal.